SEVENTH APPROXIMATION
DATA FORM FOR CONVENTIONAL ASSESSMENT UNITS (NOGA, Version 4, 4-10-01)

IDENTIFICATION INFORMATION

Assessment Geologist:……..	D.K. Higley	Date:	4/20/2001
Region:………………………..	North America	Number:	5
Province:…………………….…	Denver Basin	Number:	5039
Total Petroleum System:……	Cretaceous Composite	Number:	503906
Assessment Unit:……………	Pierre Shale Sandstones	Number:	50390601
Based on Data as of:……….	NRG 1998, PI WHCS 1998		
Notes from Assessor……….	U.S lower 48 growth function (e2)		

CHARACTERISTICS OF ASSESSMENT UNIT

Oil (<20,000 cfg/bo overall) **or** Gas (>20,000 cfg/bo overall):…   Oil

What is the minimum accumulation size?……….   0.5   mmboe grown
(the smallest accumulation that has potential to be added to reserves in the next 30 years)

No. of discovered accumulations exceeding minimum size:……..   Oil: 4   Gas: 2
Established (>13 accums.) _____   Frontier (1-13 accums.) X   Hypothetical (no accums.) _____

Median size (grown) of discovered oil accumulation (mmbo):
1st 3rd 42.1   2nd 3rd 2.4   3rd 3rd _____
Median size (grown) of discovered gas accumulations (bcfg):
1st 3rd _____   2nd 3rd _____   3rd 3rd _____

Assessment-Unit Probabilities:

Attribute	Probability of occurrence (0-1.0)
1. **CHARGE:** Adequate petroleum charge for an undiscovered accum. > minimum size…………….	1.0
2. **ROCKS:** Adequate reservoirs, traps, and seals for an undiscovered accum. > minimum size……	0.95
3. **TIMING OF GEOLOGIC EVENTS:** Favorable timing for an undiscovered accum. > minimum size	1.0

Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):……...……....…   0.95

4. **ACCESSIBILITY:** Adequate location to allow exploration for an undiscovered accumulation
    > minimum size………………………………………………..………………..…….………   1.0

UNDISCOVERED ACCUMULATIONS
No. of Undiscovered Accumulations: How many undiscovered accums. exist that are > minimum size?:
(uncertainty of fixed but unknown values)

	min. no. (>0)		median no.		max no.	
Oil Accumulations:…………………	1		2		4	
Gas Accumulations:………………	1		2		3	

Size of Undiscovered Accumulations: What are the anticipated sizes (**grown**) of the above accums.?:
(variations in the sizes of undiscovered accumulations)

	min. size		median size		max. size	
Oil in Oil Accumulations (mmbo):…..….	0.5		0.8		5	
Gas in Gas Accumulations (bcfg):….….	3		4.8		30	

AVERAGE RATIOS FOR UNDISCOVERED ACCUMS., TO ASSESS COPRODUCTS
(uncertainty of fixed but unknown values)

Oil Accumulations:	minimum	median	maximum
Gas/oil ratio (cfg/bo)………………….……………	2000	4000	6000
NGL/gas ratio (bngl/mmcfg)………………....….	50	100	150

Gas Accumulations:	minimum	median	maximum
Liquids/gas ratio (bngl/mmcfg)……………..……..	30	60	90
Oil/gas ratio (bo/mmcfg)………………………….			

SELECTED ANCILLARY DATA FOR UNDISCOVERED ACCUMULATIONS
(variations in the properties of undiscovered accumulations)

Oil Accumulations:	minimum	median	maximum
API gravity (degrees)………………..……………	40	45	55
Sulfur content of oil (%)……………………..…..	0.01	0.05	1
Drilling Depth (m) ………………..……………..	600	1400	1800
Depth (m) of water (if applicable)……………..….			

Gas Accumulations:	minimum	median	maximum
Inert gas content (%)……………………....……	0.3	0.9	2.5
CO_2 content (%)…………………………....….	0.1	1	3
Hydrogen-sulfide content (%)……………….……	0	0.1	1
Drilling Depth (m)………………..………………	600	1200	1500
Depth (m) of water (if applicable)………………….			

Assessment Unit (name, no.)
Pierre Shale Sandstones, 50390601

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO LAND ENTITIES
Surface Allocations (uncertainty of a fixed value)

1. Federal Lands   represents   8.4   areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):………….….			
Volume % in parcel (areal % x richness factor):…		2	
Portion of volume % that is offshore (0-100%)……		0	

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):………….….			
Volume % in parcel (areal % x richness factor):…		1	
Portion of volume % that is offshore (0-100%)……		0	

2. Private Lands   represents   areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):………….….			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):………….….			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

3. Tribal Lands   represents   0   areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):………….….			
Volume % in parcel (areal % x richness factor):…		0	
Portion of volume % that is offshore (0-100%)……		0	

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):………….….			
Volume % in parcel (areal % x richness factor):…		0	
Portion of volume % that is offshore (0-100%)……		0	

4. State Lands 1   represents   areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):………….….			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):………….….			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

5. State Lands 2 _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

6. Other Lands (Private and State) _____ represents __91.6__ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		98	
Portion of volume % that is offshore (0-100%)……		0	

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		99	
Portion of volume % that is offshore (0-100%)……		0	

7. Colorado Total _____ represents __100__ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		100	
Portion of volume % that is offshore (0-100%)……		0	

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		100	
Portion of volume % that is offshore (0-100%)……		0	

8. State Total 2 _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO FEDERAL LANDS
Surface Allocations (uncertainty of a fixed value)

9. BLM _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

10. NPS _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

11. USFS _____ represents _7.1_ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		1.7	
Portion of volume % that is offshore (0-100%)……		0	

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		0.8	
Portion of volume % that is offshore (0-100%)……		0	

12. USFWS _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

13. DOE _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………..…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………..…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

14. DOD _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………..…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………..…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

15. BOR _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………..…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………..…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

16. Other Federal Lands _____ represents ___1.3___ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………..…			
Volume % in parcel (areal % x richness factor):…		0.3	
Portion of volume % that is offshore (0-100%)……		0	

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………..…			
Volume % in parcel (areal % x richness factor):…		0.2	
Portion of volume % that is offshore (0-100%)……		0	

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO ECOSYSTEMS
Surface Allocations (uncertainty of a fixed value)

1. <u>Northern Parks and Ranges (NPRN)</u> represents <u>19.48</u> areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		5	
Portion of volume % that is offshore (0-100%)……		0	

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		5	
Portion of volume % that is offshore (0-100%)……		0	

2. <u>Central High Plains (CNHP)</u> represents <u>80.52</u> areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		95	
Portion of volume % that is offshore (0-100%)……		0	

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…		95	
Portion of volume % that is offshore (0-100%)……		0	

3. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

4. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

5. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

6. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

7. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

8. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

9. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

10. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

11. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

12. _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):…………….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

ALLOCATIONS OF POTENTIAL ADDITIONS TO RESERVES TO LAND ENTITIES
Subsurface Allocations (uncertainty of a fixed value)

Based on Data as of: _____ No available data _____

1. All Federal Subsurface _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

2. Other Subsurface _____ represents _____ areal % of the total assessment unit

Oil in Oil Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Accumulations:	minimum	median	maximum
Richness factor (unitless multiplier):……….….…			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			